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EXAMINER	
FERNANDEZ RIVAS, OMAR F	
ART UNIT	PAPER NUMBER
2129	

DATE MAILED: 04/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/759,023	BINGHAM, CLIFTON W.
	Examiner	Art Unit
	Omar F. Fernández Rivas	2129

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152..

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5/12/2004*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-22 are pending on this application.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-22 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The computer system must set forth a practical application of judicial exception to produce a real-world result. Benson, 409 U.S. at 71-72, 175 USPQ at 676-77. The invention is ineligible because it has not been limited to a substantial practical application.

For a claimed invention to be statutory the claimed invention must produce a useful, concrete, and tangible result. The Courts have found that subject matter that is not a <u>practical application or use</u> of an idea, a law of nature or a natural phenomenon is not patentable. See, e.g., *Rubber-Tip Pencil Co. v. Howard*, 87 U.S. (20 Wall.) 498, 507 (1874) ("idea of itself is not patentable, but a new device by which it may be made practically useful is"); *Warmerman*, 33 F.3d at 1360, 31 USPQ2d at 1759.

For a claimed invention to be statutory under 35 U.S.C. 101, the claims must have the FINAL RESULT (not the steps) produce a useful (specific, substantial, AND credible), concrete (substantially repeatable/ non-unpredictable), AND tangible (real world/ non-abstract) result.

If the specification discloses a practical application but the claim is broader than the disclosure such that it does not require the practical application, then the claim must be amended. A claim that recites a computer that solely calculates a mathematical formula is not statutory.

In the present case, claim 1 describes a method for detecting changes in a multidimensional data set. The claim describes the steps for making said detection. However, the result obtained from the method is not provided to a device to make it useful or presented to a user in a way that such result could be perceived and used. The result is kept within the computer system, which is considered manipulation of abstract data inside of a computer and is thus not tangible. Claims 2-16 describe further steps for carrying out the task of claim 1, but fail to solve the tangibility issue of claim 1 and are therefore rejected.

Claims 17-22 describe a method functionally equivalent to the method of claims 1-16 and are rejected on the same basis.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4, 6-12 and 15-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Sun et al (US Patent #6,272,250, referred to as **Sun**).

Claim 1

Sun anticipates a method for detecting unanticipated changes in a multidimensional data set (**Sun**: abstract, L1-15; C3, L 24-31) comprising the steps of: (a) selecting a subset of the multidimensional data set, each data set of said subset being correlated with the remaining data sets thereof by at least a predetermined criterion (**Sun**: abstract, L1-5; C2, L 21-35; C3, L62-67, C4, L1-13; Figs. 2-3; Examiner's note (EN): pixels are a subset of the image frame. They are correlated by color); (b) partitioning each data set of said subset into a plurality of locations, each of said plurality of locations sized in accordance with a size parameter of known features of the multidimensional data sets (**Sun**: abstract, L1-10; C2, L 21-60; C4, L48-61; C5, L56-65; EN: clusters are locations, the vigilance parameter is a size parameter); (c) assigning a vector to each of said plurality of locations in each data set of said subset, said vector including a plurality of scalar components (**Sun**: C2, L20-35; C4, L40-47; C10, claim 1, C12, claim 15; EN: defining a prototype vector for each cluster); (d) estimating from at least one of said data sets of said subset at least one expected vector for each of said plurality of locations (**Sun**: C2, L20-35; C4, L40-47; C10, claim 1, C12, claim 15; EN: changing the prototype vector after allocating the input vector); (e) calculating a vector of expected ranges for each of said plurality of locations from said at least one expected vector (**Sun**: abstract, L5-7; C2, L47-60; C5, L56-67; C11, claim 8; Fig. 3; EN: comparing the vector distance magnitude and the vigilance value); and, (f) comparing a vector assigned to each of said plurality of locations of at least one of said data sets of said subset to said vector of expected ranges corresponding to said each of said

plurality of locations and identifying a location as including an unanticipated change when a predetermined number of said scalar components of said vector assigned to each of said plurality of locations exceeds said expected range in said corresponding vector of expected ranges (**Sun**: abstract; C3, L27-31; C6, L35-58; C7, L46-60; C10, claims 10 and 11; Fig. 3).

Claim 2

Sun anticipates providing a plurality of artificial neural networks, each of said plurality of artificial neural networks providing one of said at least one expected vector at an output thereof responsive to a vector assigned to one of said plurality of locations applied to an input thereof (**Sun**: C1, L25-67, C2, L1-17; C2, L36-46; C10, claim 1; Figs. 1-2; EN: the invention is a modified version of the ART-2 system which uses neural networks. It receives an input vector and outputs the prototype vector of the cluster to allocate the data in the input vector).

Claim 3

Sun anticipates the step of training said plurality of artificial neural networks on said subset of the multidimensional data set (**Sun**: C1, L42-67, C2, L1-15; C4, L14-47; Figs. 1-2).

Claims 4 and 18

Sun anticipates said training of said artificial neural networks includes the steps of: (1) dividing said subset into a training subset and an evaluation hold out subset; (2) initializing each node of said artificial neural network with a random value; (3) training each of said plurality of artificial neural networks on said vector assigned to each of said

plurality of locations of said training set according to a predetermined training method; (4) applying said vector assigned to each of said plurality of locations of said evaluation hold out subset to said input of each of said plurality of artificial neural networks; (5) computing an error function on a difference between each of said vectors assigned to each of said plurality of locations of said evaluation hold out subset and said corresponding estimated vector; and (6) repeating said steps (2)-(6) until said error function is minimized (**Sun**: C4, L14-67; C5, L1-55; Fig. 3; EN: this is standard training on a neural network).

Claim 6

Sun anticipates said estimating step (d) includes the steps of: (1) dividing said subset into a first subset and a second subset (**Sun**: C2, L20-35; EN: pixels (input vector) are grouped into clusters); (2) applying said vector assigned to each of said plurality of locations of said first subset to said input of each of said plurality of artificial neural networks for providing thereby a corresponding one of said at least one expected vector at said output thereof (**Sun**: C2, L20-46; C10, claim 1; C12, claim 15; Figs. 2-3).

Claim 7

Sun anticipates said calculating step (e) includes the step of calculating said vector of expected ranges from said plurality of scalar components of said at least one expected vector output from each of said plurality of artificial neural networks (**Sun**: abstract, L5-7; C2, L47-60; C5, L56-67; C11, claims 8 and 9; Figs. 2-3).

Claim 8

Sun anticipates the step of applying said vector assigned to each of said plurality of locations of said second subset to said input of each of said plurality of artificial neural networks for providing thereby one of said at least one expected vector at an output thereof (**Sun**: C2, L27-46, C4, L40-67; C11, claims 8 and 9; EN: the output is the prototype vector of the cluster).

Claim 9

Sun anticipates said calculating step (e) includes the step of calculating said vector of expected ranges from said plurality of scalar components of said at least one expected vector corresponding to said first subset applied to said input of said plurality of artificial neural networks and from said plurality of scalar components of said at least one expected vector corresponding to said second subset applied to said input of said plurality of artificial neural networks (**Sun**: C2, L20-35, C4, L40-47; C7, L46-60; Fig. 3).

Claims 10 and 19

Sun anticipates one of said at least one predetermined criterion with which each data set of said subset is correlated is time (**Sun**: C4, L27-33; C6, L49-62; C7, L46-61; EN: processing images in a sequence and detecting changes between images in the sequence is correlating based on time).

Claims 11 and 20

Sun anticipates each of said plurality of scalar components is a measurement of a physical quantity corresponding to each of said plurality of locations (**Sun**: C4, L40-47;

C10, claim 1; EN: a centroid value is a physical quantity).

Claim 12

Sun anticipates said measurement of said physical quantity for each of said plurality of scalar components in each vector assigned to each of said plurality of locations is independent of said measurement of said physical quantity for remaining ones of said plurality of scalar components in said vector (**Sun**: C4, L40-47; C7, L12-18; C10, claim 1).

Claim 15

Sun anticipates each data set of said subset includes at least one image of pixels, said pixels representing said scalar components and grouped to form said locations (**Sun**: C2, L27-35; C3, L58-67; C4, L1-13; Figs. 1-2).

Claim 16

Sun anticipates the step of excluding a location from being identified as including the unanticipated change if less than a predetermined number of locations adjacent thereto are identified as including the unanticipated change (**Sun**: C6, L35-48; C7, L52-61).

Claim 17

Sun anticipates a method for detecting unanticipated changes in a set of images, each of the set of images including a plurality of pixels (**Sun**: abstract), the method comprising the steps of: (a). correlating the set of images by at least one predetermined criterion (**Sun**: abstract, L1-5; C2, L 21-35; C3, L62-67, C4, L1-13; Figs. 2-3); (b). grouping a predetermined number of adjacent ones of the plurality of pixels into a

plurality of locations (**Sun**: abstract, L1-10; C2, L 21-60; C4, L48-61; C5, L56-65; EN: clusters are locations); (c). assigning a vector to each of said locations, each vector including a plurality of scalar components **Sun**: C2, L20-35; C4, L40-47; C10, claim 1, C12, claim 15; EN: defining a prototype vector for each cluster); (d). providing at least one artificial neural network for predicting, in accordance with said correlation by said at least one predetermined criterion, a vector for each of said plurality of locations from a vector of a corresponding location in a subset of the set of images (**Sun**: C1, L25-67, C2, L1-17; C2, L36-46; C10, claim 1; Figs. 1-2); (e). training said at least one artificial neural network on the set of images (**Sun**: C1, L42-67, C2, L1-15; C4, L14-47; Figs. 1-2); (f). predicting a first expected vector by each of said at least one artificial neural network for each of said plurality of locations from a first subset of the set of images (**Sun**: C1, L25-67, C2, L1-17; C2, L36-46; C10, claim 1; Figs. 1-2; EN: the invention is a modified version of the ART-2 system which uses neural networks. It receives an input vector and outputs the prototype vector of the cluster to allocate the data in the input vector); (g). predicting a second expected vector by each of said at least one artificial neural network for each of said plurality of locations from a second subset of the set of images (**Sun**: C2, L20-46, C4, L40-67; C10, L31-38 Fig. 3; EN: determining a new prototype vector is predicting a second expected vector); (h). computing, from said first expected vector from said each of said at least one artificial neural network and said second expected vector from said each of said at least one artificial neural network, a vector of expected ranges for each of said plurality of locations (**Sun**: abstract, L5-7; C2, L47-60; C5, L56-67; C11, claim 8; Fig. 3; EN: comparing the vector distance magnitude

and the vigilance value); (i). computing a weighted vector of scalar components from said first expected vector from each of said at least one artificial neural network for each of said plurality of locations (**Sun**: C4, L40-47; EN the centroid value is a weighted vector); and (j). comparing said weighted vector to said vector corresponding to said location in said second subset of the images and identifying differences therebetween as unanticipated changes when said differences exceed said expected range in said corresponding vector of expected ranges (**Sun**: C6, L35-48; C7, L32-66).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims are 5,14 and 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al as set forth above in view of Gopal et al ("Remote Sensing of Forest Change Using Artificial Neural Networks"; referred to as **Gopal**).

Claim 5

Sun does not teach said error function is a root mean squared error function.

Gopal teaches said error function is a root mean squared error function (**Gopal**: page 400, C2, L20-33, page 401, C1, L1).

It would have been obvious to one of ordinary skill in the arts at the time of the applicant's invention to modify the teachings of Sun by using a root mean squared error

function as taught by Gopal for the purpose of having a metric to measure how much an output from the neural network differs from a desired output so that it can be trained to minimize that difference.

Claims 14 and 22

Sun does not teach the step of orthorectifying each data set of said subset so that features of each data set are sized in accordance with said size parameter.

Gopal teaches the step of orthorectifying each data set of said subset so that features of each data set are sized in accordance with said size parameter (**Gopal**: page 399, C1, L4-8; EN: performing orthogonalization is orthorectifying).

It would have been obvious to one of ordinary skill in the arts at the time of the applicant's invention to modify the teachings of Sun by incorporating the step of orthorectifying each data set of said subset as taught by Gopal for the purpose of decomposing each data set into independent groups based on a given characteristic.

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 13 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun as set forth above in view of Yamamoto et al ("A Change Detection Method for Remotely Sensed Multispectral and Multitemporal Images Using 3-D Segmentation"; referred to as Yamamoto).

Claims 13 and 21

Sun does not teach said partitioning step (b) includes the step of sizing each of said plurality of locations to be one-half to one-third said size parameter of said known features.

Yamamoto teaches said partitioning step (b) includes the step of sizing each of said plurality of locations to be one-half to one-third said size parameter of said known features (**Yamamoto**: page 977, C2, L5-10; Fig. 1).

It would have been obvious to one of ordinary skill in the arts at the time of the applicant's invention to modify the teachings of Sun by incorporating said partitioning step (b) includes the step of sizing each of said plurality of locations to be one-half to one-third said size parameter of said known features as taught by Gopal for the purpose of having smaller sized locations so that the search can be made more efficient.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Hojnacki et al US Patent #6,163,620

Sutton et al. US Patent #5,978,505

9. Claims 1-22 are rejected.

Correspondence Information

10. Any inquires concerning this communication or earlier communications from the examiner should be directed to Omar F. Fernández Rivas, who may be reached Monday through Friday, between 8:00 a.m. and 5:00 p.m. EST. or via telephone at (571) 272-2589 or email omar.fernandezrivas@uspto.gov.

If you need to send an Official facsimile transmission, please send it to (571) 273-8300.

If attempts to reach the examiner are unsuccessful the Examiner's Supervisor, David Vincent, may be reached at (571) 272-3080.

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Wednesday, March 29, 2006

OFR

P.E.